
Comparison of Native American Births in Upstate New York with Other Race Births, 1980-86

GERMAINE M. BUCK, PhD
MARTIN C. MAHONEY, PhD
ARTHUR M. MICHALEK, PhD
ETTA J. POWELL, MS
JAMES A. SHELTON

Dr. Buck is a Clinical Assistant Professor, and Mr. Shelton is a Research Assistant in the Department of Social and Preventive Medicine, School of Medicine and Biomedical Sciences, State University of New York at Buffalo. Dr. Mahoney, at the time of this study, was a Research Scientist at the New York State Department of Health; he is currently a medical student at Buffalo School of Medicine and Biomedical Sciences, State University of New York. Ms. Powell is a Biostatistician at the New York State Department of Health. Dr. Michalek is Assistant Director of Education, Education Department, Roswell Park Cancer Institute.

Tearsheet requests to Dr. Germaine Buck, Department of Social and Preventive Medicine, School of Medicine and Biomedical Sciences, 270 Farber Hall, Buffalo, NY 14214, telephone 716-831-2975.

Synopsis

The purpose of this study was to describe the neonatal characteristics of Native American (Indian) infants and the antenatal characteristics of

their mothers as compared with white, black, and other race infants. The study population comprised 979,444 live births to upstate New York (exclusive of New York City) resident mothers between 1980 and 1986.

Data were abstracted from vital records (birth certificates) and analyzed using a variety of descriptive statistics. Mothers of Native American and black infants had similar antenatal profiles (that is, younger, higher parity, lower educational attainment, and delayed initiation of prenatal care), which differed from mothers of white or other race infants.

Despite having at-risk mothers, Native American infants were similar to white and other race infants with respect to the percentage of births that were considered low birth weight or premature. Black infants were twice as likely as the other three groups of infants to be low birth weight or premature. These findings suggest that other factors appear to be important in determining neonatal outcome and that typical at-risk antenatal profile of mothers may not be consistent across all racial groups.

THERE HAS BEEN a substantial increase in the number of Native or American Indian births in the United States during the past two decades. In 1970, there were only 24,218 American Indian births in the United States compared with 38,844 in 1984 (1). American Indian births increased by 7 percent between 1970 and 1975, 34 percent between 1975 and 1980, and 13 percent between 1980 and 1984. This increase is noticeably different from the declining (16 percent) or only moderately increasing (2 percent) birth rates for all races combined in the United States during 1970-75 and 1980-84, respectively.

As noted in the 1980 U.S. census report, part of this increase may be an artifact stemming from the more frequent reporting of Indian race on birth certificates by non- or mixed-Indian mothers (2). However, part of the increase in American Indian births may be attributed to the relatively young age of the Indian female population, especially as

compared with whites; that is, median age in 1980 was 23.4 years for American Indians and 32.5 years for whites (2). Fertility rates (births per 1,000 women ages 15-44 years) are reportedly higher for American Indian women, 103.6, than other racial groups including whites, 64.7, and blacks, 88.1 (3). Although fertility rates are a measure of reproductive performance (live births), they do not provide insight into whether the births were planned or unplanned or other personal aspects of childbearing.

Native American infants and their mothers represent a relatively unstudied population, from an epidemiologic perspective. Much of what we know about Native American infants and their mothers comes from data collected by the Indian Health Service (IHS). The IHS provides services and collects data from American Indian and Alaskan Native beneficiaries who live on or near reservations and on traditional and trust lands. Data

. . . mothers of Native American infants (21.6 percent) who had a low birth weight infant were more likely to be younger than 20 years at delivery than either white (11.3 percent) or other race (4.8 percent) mothers but not black mothers (25.9 percent).

generated by the IHS are typically compared with the U.S. all races population. Unfortunately, annual IHS reports do not include information on antenatal and neonatal characteristics of offspring. A more indepth description of the IHS strengths and limitations is available elsewhere (4). To date, there remains little empirical data describing antenatal characteristics of Native American mothers and neonatal characteristics of their offspring in relation to other racial groups of mothers and infants for a geographic defined area.

The purpose of this study is twofold: (a) to describe the antenatal and neonatal characteristics of Native American infants and their mothers and (b) to compare these characteristics with other racial groups of infants and mothers (that is, whites, blacks, and other races) residing in New York State excluding New York City. This avenue of research will, it is hoped, provide further insight into the needs of pregnant Native American women to facilitate the tailoring of prenatal and infant care services designed to ensure the health and well-being of this population.

Methods

Study population. The population for this descriptive study comprises all infants born alive to upstate New York (exclusive of New York City) resident mothers between 1980 and 1986 and for whom live birth certificates were filed with the New York State Department of Health (NYSDOH). The study population included 983,693 live births during 1980–86; however, 4,249 births (less than 1 percent) were excluded due to the absence of data on infant's race, that is, no race specified for parents. No further exclusion criteria were used in selecting births for study purposes. Thus, the study population included the remaining 979,444 live births.

Data collection. Data were collected from the computerized statistical tape files of live births main-

tained by the NYSDOH's Bureau of Production Systems Management. Data were collected from infant birth certificates and included antenatal characteristics of the mothers (for example, age at delivery, educational attainment, parity, and date of first prenatal visit), and neonatal characteristics of infants (plurality of birth, birth weight, and gestational age).

Operational definitions. A live birth was defined for study purposes according to the definition of the NYSDOH (5):

. . . as the complete expulsion or extraction from its mother of a product of conception, irrespective of duration of pregnancy, which, after such separation breathes or shows any other evidence of life such as beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles whether or not the umbilical cord has been cut or the placenta is attached.

Infant's race was based on the reported race of the mother and father using the criteria developed by the National Center for Health Statistics (NCHS) (6). Briefly stated, this method of race determination defines a child's race as that of the parents. If one parent is white and the other is not, the child's race is that of the nonwhite parent. If neither parent is white, the child is assigned the father's race except if either parent is Hawaiian or part-Hawaiian. In this latter case, the child is determined to be Hawaiian. If one parent's race is missing, the child is assigned the other parent's race. If both parents' races are missing, the child's race is listed as "not stated." Race was subsequently categorized as Native American, white, black, or other race (that is, Chinese, Filipino, Hawaiian Islander, and Japanese). Hispanic ethnicity was not considered. Prior to 1988, Hispanic ethnicity was not recorded on birth certificates in New York State.

Birth weight is reported in grams (g) and gestational age in weeks (imputed from the last menstrual period method listed on birth certificates). Birth weight is further categorized as very low birth weight (VLBW—less than 1,500 g), moderately low birth weight (MLBW—1,500–2,499 g), adequately sized (2,500–3,999 g), excessively sized (4,000–4,999 g) and macrosomia (5,000 g or more). Gestational age is further categorized as extremely premature (less than 28 weeks gestation), moderately premature (28–36 weeks), term (37–42 weeks), and post-term (43 or more weeks).

Analysis. Descriptive statistic techniques were used to determine the distribution of neonatal and antenatal study variables by infant's race. Average annual fertility rates were calculated for each racial group using the following formula:

(total number of race specific births per 7-year study period ÷ 1980 female population ages 15–44 years) × 1,000 population.

These denominator data were obtained from the 1980 census publications (7). The calculation of Native American fertility rates was based on all determined Native American births and not necessarily births to Native American mothers. This was also true for the other race-specific fertility rates.

Infants for whom data were missing on race and any of the study variables were excluded from the analysis. Given that this was a population-based cohort study and the low overall percentage of missing data, statistical significance was not formally tested. Missing data for study variables were minimal—infant's race, maternal age, birth order, and birth weight, all less than 1 percent; maternal education, 2 percent; and prenatal care and gestational age, 3 percent.

Results

As table 1 reflects, the 870,318 white births comprised the largest race-specific group, followed by blacks (91,526), other races (14,285), and Native Americans (3,315). Further breakdown of other races was not available for study purposes. Average annual fertility rates were observed to vary by infant's race. The highest fertility rates were for black infants (81.9 per 1,000) followed by Native American (73.6), white (56.8), and other race (44.4) infants.

Table 2 reflects some interesting differences between racial groups by antenatal characteristics of mothers. Mothers of Native American infants were more likely to be younger, less educated, and of higher parity than mothers of white or other race infants, and to a lesser extent than mothers of black infants. Approximately 21 percent of mothers of Native American infants were less than 20 years of age at delivery during 1980–86 compared with 24 percent of mothers of black, 8.1 percent of mothers of white, and 3.2 percent of mothers of other race infants. Approximately 29 percent of mothers of white infants and 46 percent of mothers of other race infants were older than 30 years at delivery between 1980–86 compared with 17 percent of

Table 1. Live births by infants' race, upstate New York (exclusive of New York City), 1980–86

	White	Native American	Black	All other ¹
Total number of births	870,318	3,315	91,526	14,285
1980 female population (ages 15–44 years) ²	2,190,736	6,438	159,737	45,942
Average annual fertility rate per 1,000 population	56.8	73.6	81.9	44.4

¹ Other races include Chinese, Filipino, Hawaiian Islander, and Japanese.

² Based on 1980 census data.

mothers of Native American and 19 percent of mothers of black infants.

Roughly one-third of mothers of Native American infants (36.1 percent) had less than a high school education at the time of delivery. A slightly lower but comparable percentage of mothers of black infants (31 percent) had less than a high school education. In contrast, only 13 percent of the mothers of white and other race infants had less than a high school education. These two groups had the highest proportions with some college—44 percent of the white group and 64 percent of the other races. Approximately one-fourth of mothers of Native American (22.3 percent) and black infants (28.1 percent) had had some college.

Mothers of Native American infants were of higher parity than the other three groups of mothers. Approximately one-third (31.5 percent) of mothers of Native American infants had a birth order of 3 or more during 1980–86. Twenty-nine percent of mothers of black infants, 23 percent of mothers of white infants, and 22 percent of mothers of other race infants had a birth order of 3 or more.

A comparable proportion of live births were products of multiple gestations across groups (data not shown). There were 18,249 (2.1 percent) white, 2,232 (2.5 percent) black, 63 (1.9 percent) Native American, and 246 (1.8 percent) other race multiple births.

Prenatal care in the first trimester was obtained by the majority of women regardless of race. Mothers of white (84.6 percent) and other race infants (79.5 percent) were more likely to receive early care than mothers of Native American (65.1 percent) or black infants (64.6 percent). Only 1 to 2 percent of the women failed to receive any care, regardless of race.

Table 2. Percent distribution of live births, by infants' race and select antenatal characteristics of mothers, upstate New York,¹ 1980-86

Maternal characteristics	Native American		White		Black		Other ²	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Age at delivery.....	3,315	100.0	870,318	100.0	91,526	100.0	14,285	100.0
Younger than 15 years.....	12	0.3	601	0.1	757	0.8	4	0.0
15-19 years.....	692	20.9	69,319	8.0	20,888	22.8	462	3.2
20-24 years.....	1,219	36.8	231,069	26.5	29,956	32.7	2,212	15.5
25-29 years.....	841	25.4	313,430	36.0	22,135	24.2	5,031	35.2
30-34 years.....	409	12.3	194,910	22.4	12,479	13.6	4,667	32.7
35-39 years.....	129	3.9	53,834	6.2	4,526	4.9	1,670	11.7
40 years and older.....	13	0.4	7,155	0.8	785	0.9	239	1.7
Education.....	3,254	100.0	854,676	100.0	87,097	100.0	13,693	100.0
Less than high school.....	1,176	36.1	110,936	13.0	26,655	30.6	1,817	13.3
High school.....	1,351	41.5	367,314	43.0	35,949	41.3	3,116	22.8
Some college.....	727	22.3	376,426	44.0	24,493	28.1	8,760	64.0
Birth order.....	3,315	100.0	870,438	100.0	91,534	100.0	14,282	100.0
1.....	1,317	39.7	375,834	43.2	38,708	42.3	5,912	41.4
2.....	954	28.8	293,365	33.7	26,279	28.7	5,281	37.0
3 or more.....	1,044	31.5	201,239	23.1	26,547	29.0	3,089	21.6
Initiation of prenatal care.....	3,224	100.0	846,051	100.0	86,459	100.0	13,799	100.0
1st trimester.....	2,099	65.1	715,443	84.6	55,861	64.6	10,966	79.5
2nd trimester.....	887	27.5	107,458	12.7	23,874	27.6	2,261	16.4
3rd trimester.....	191	5.9	17,564	2.0	4,739	5.5	480	3.5
None.....	47	1.5	5,586	0.7	1,985	2.3	92	0.7

¹ Exclusive of New York City.

² Other race includes Chinese, Filipino, Hawaiian Islander, and Japanese births.

NOTE: Analysis excludes the following births with missing data: 4,249 race,

140 maternal age, 20,864 maternal education, 15 birth order, and 30,051 prenatal care.

Despite comparable percentages of multiple births across the four racial groups of infants (approximately 2 percent), differences in birth weight and gestational age distributions were observed. Table 3 suggests that Native American, white, and other race infants had relatively similar birth weight distributions; but all differed from that observed for black infants. Eighty-seven percent of other race infants were of adequate size followed by white infants (83 percent), black infants (82 percent), and Native American infants (80 percent). Black infants were more likely to be of diminished birth size. Native American infants represented the highest proportion—13 percent—of excessively sized and macrosomic infants compared with 12 percent of white and 6 percent of black and other race infants. Conversely, the 1.2 percent of Native American infants that were VLBW was half the 2.8 percent observed for black infants but slightly higher than 0.9 percent observed for white and other race infants (0.9 percent). A similar pattern was observed for infants of moderately low birth weights. Approximately 10 percent of black infants had MLBW compared with about 6 percent Native American and white infants.

Gestational age distributions varied by infant's race (table 3). As with birth weight, 86 percent of

other race infants were born at term, followed by mothers of white (85 percent), Native American (80 percent), and black (76 percent) infants. Differences were observed between the four racial groups with respect to the percentage of infants who were considered pre- or post-term births. The 0.9 percent of Native American infants who were extremely premature was similar to that for white (0.6 percent) and other race infants (0.5 percent). Black infants had at least twice the percentage of extremely premature infants when compared with the other three groups. A higher percentage of Native American infants (10.4 percent) were moderately premature when compared with white (7.1 percent) or other race (8.3 percent) infants. However, black infants were more likely to be moderately premature than Native American infants, that is, 14.8 percent compared with 10.4 percent. Native American infants had the highest proportion of post-term births (9.2 percent) followed by black (7.3 percent), white (7.1 percent), and other race (5.3 percent) births.

The differences in birth weight and gestational age distributions support the need to assess these two factors simultaneously, especially given their interrelatedness. As suggested by table 3, the majority of low birth weight (LBW) infants had

Table 3. Percent birth weight, gestational age, and low birth weight births, by infants' race, upstate New York,¹ 1980-86

Category	Percent of births			
	Native American	White	Black	Other ²
<i>Birth weight</i>				
Less than 1,500 grams (very low birth weight)	1.2	0.9	2.8	0.9
1,500-2,499 grams (moderately low birth weight)	5.8	5.8	9.6	5.4
2,500-3,999 grams (adequately sized)	80.0	83.0	82.0	87.0
4,000-4,999 grams (excessively sized)	12.9	11.9	5.6	6.1
5,000 or more (macrosomic)	0.4	0.2	0.1	0.1
<i>Gestational age</i>				
Less than 28 weeks (extremely pre-term)	0.9	0.6	2.0	0.5
28-36 weeks (moderately pre-term)	10.4	7.1	14.8	8.3
37-42 weeks (term)	80.0	85.0	76.0	86.0
43 weeks or more (post-term)	9.2	7.1	7.3	5.3
<i>Births under 2,500 grams by gestational age</i>				
Less than 37 weeks	60	58	60	52
37 weeks or more	40	42	40	49

¹ Exclusive of New York City. ² Other race includes Chinese, Filipino, Hawaiian Islander, and Japanese births.

Table 4. Percent distribution of low birth weight (less than 2,500 grams) live births, by infants' race and select maternal antenatal characteristics, upstate New York,¹ 1980-86

Antenatal characteristics	Native American		White		Black		Other ²	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Age at delivery	232	100.0	46,897	100.0	11,295	100.0	894	100.0
Younger than 20 years	50	21.6	5,284	11.3	2,930	25.9	43	4.8
20 years or older	182	78.4	41,613	88.7	8,365	74.1	851	95.2
Education	227	100.0	45,398	100.0	10,566	100.0	840	100.0
Less than high school	81	35.7	8,958	19.7	3,822	36.2	136	16.2
High school or more	146	64.3	36,440	80.3	6,744	63.8	704	83.8
Initiation of prenatal care	220	100.0	44,149	100.0	10,173	100.0	841	100.0
1st trimester	137	62.3	35,259	79.9	6,134	60.3	659	78.4
2nd-3rd trimester	83	37.7	8,890	20.1	4,039	39.7	182	21.6

¹ Exclusive of New York City.

² Other race includes Chinese, Filipino, Hawaiian Islander, and Japanese.

NOTE: Analysis restricted to those live births for whom data on race and select maternal characteristics were available on birth certificates.

gestations of less than 37 weeks. Sixty percent of Native American and black LBW infants were premature compared with 58 percent of white and 52 percent of other race LBW infants. However, it is noteworthy that 40 percent or more of the remaining LBW infants, regardless of race, were considered to be term pregnancies (more than 37 weeks gestation). Among them, other race infants (49 percent) represented the highest percentage of LBW births.

Further sociodemographic differences were observed among the four groups of mothers when the analysis was restricted to LBW infants born between 1980 and 1986. As table 4 shows, mothers of Native American infants (21.6 percent) who had a LBW infant were more likely to be younger than 20 years at delivery than either white (11.3 percent) or other race (4.8 percent) mothers but not black

mothers (25.9 percent). Comparable percentages of Native American (35.7 percent) and black (36.2 percent) mothers did not complete high school. These proportions are considerably higher than those observed for white (19.7 percent) and other race (16.2 percent) mothers. Despite the observation that the majority of mothers initiated prenatal care during the first trimester, care was instituted later by mothers of 37.7 percent of Native American infants, 39.7 percent of black infants, 20.1 percent of white infants, and 21.6 percent of other race infants.

Discussion

Two noteworthy findings stem from this descriptive study of live births in upstate New York during the 7-year period. First, mothers of Native Ameri-

'We also observed that Native American infants accounted for a higher percentage of post-term and excessively sized babies than any of the other groups.'

can infants appeared to resemble more closely mothers of black infants than mothers of white or other race infants with respect to the antenatal characteristics under study. Second, Native American infants appeared to resemble white and other race infants more closely than black infants. Mothers of Native American and black infants tended to be younger, of higher parity, and less educated than mothers of white or other race infants. In addition, the former two groups of mothers were more likely to initiate prenatal care later than the latter two groups of mothers. Given that the four antenatal characteristics under study have been identified as principal risk factors for adverse pregnancy outcomes and, in particular, LBW and prematurity (8), it is somewhat surprising to observe that Native American and black infants varied with respect to LBW or prematurity. Black infants were twice as likely as the other three groups of infants to be LBW or premature. Despite having mothers who reportedly would be considered at risk for these two adverse outcomes, Native American infants were comparable with white and other race infants in terms of the percentage of LBW or premature births.

We also observed that Native American infants accounted for a higher percentage of post-term and excessively sized babies than any of the other groups. This finding is consistent with previous reports that Native American infants tend to be heavier at birth and more likely to be post-term than infants of other races. Several reasons have been suggested for this finding, including those attributed to methodological errors in determining gestation as well as an increased incidence of gestational diabetes (9) or diabetes mellitus (10) among Indian women.

Our findings suggest that other sociodemographic, behavioral, or cultural factors may be in effect and account for the differences in the percentage of LBW and premature births among Native American and black mothers who appear to have similar at-risk antenatal profiles. For example, age at first pregnancy has been reported to be influenced by

social and cultural factors (11). Childbearing at young age often occurs under adverse social conditions. Unfortunately, this study was unable to delve into the effects, if any, of other factors (namely, smoking, alcohol, drugs, infections) that may account for the differences in neonatal outcomes across social groups of infants, given that this study was based on data abstracted from birth certificates.

Our findings do, however, support those reported by the NCHS (1). This study assessed birth certificate data for the United States obtained through the Vital Statistics Cooperative Program to describe the characteristics of Indian, white, and black births in the United States during 1984. In this study, Indian mothers were similar to black mothers in terms of young age (less than 20 years), high parity (more than 4), lower educational attainment (less than high school), single marital status, and late initiation of prenatal care. Similar percentages of white and Indian births were LBW or premature; black births were twice as likely to be LBW or premature.

In a recent study of race-specific infant mortality in the United States, linked birth and death certificates for 1983 and 1984 were used to assess maternal characteristics in relation to LBW and infant mortality (12). American Indian and black mothers both had high risk profiles (young, unmarried, and poor prenatal care) compared with non-Hispanic white mothers. However, American Indian mothers had lower neonatal mortality and lower low birth weight rates than black mothers, but comparable with the rates of white mothers.

The results of our study coupled with earlier reports (1, 12) suggest that despite having mothers with at-risk antenatal profiles, Native American infants do not appear to be at increased risk of LBW or prematurity. Black infants with similarly at-risk mothers do, however, appear to be at increased risk for these outcomes.

We are not suggesting that the antenatal characteristics do not impact on neonatal outcome. In fact, these factors are important, especially when assessing LBW infants by race. Among LBW infants, higher percentages of Native American and black infants are born to young mothers with lower educational attainments than white or other race infants. Regardless of race, a sizable proportion (20–40 percent) of mothers with LBW infants initiated prenatal care after the first trimester.

These findings need to be cautiously interpreted given the inherent problems associated with the use of vital records. We were unable to validate data

recorded on birth certificates for the antenatal or neonatal characteristics under study. Our data are based entirely on vital certificate information. Our fertility rates used the 1980 female population ages 15-44 years as the denominator whereas the numerator includes 7 years of births.

Unfortunately, we did not have reliable annual population-based ethnic data for denominators in the calculation of race-specific fertility rates. As a result, we used census data for 1980 for calculation of fertility rates. Gestational age was determined from the date of the last menstrual period (LMP) as noted on the birth certificate, and this method has repeatedly been shown to be less accurate than ultrasonography (13). Still, there is no a priori reason to assume that gestational age is systematically more or less reliable for Native Americans or any particular racial group. There are some data, however, which suggest the accuracy of LMP data varies by socioeconomic status of mothers (14).

The method of determining infant's race may be problematic. Although this method is consistent with that used by the NCHS for determining race, we are aware of the potential for misclassification bias with respect to race. Our method of determining infant's race may result in some Native American births being classified as another race. We recognize that misclassification of the infant's race may occur if either parent is Hawaiian or if a Native American mother's race is missing and the father is not a Native American. In either instance, the child would not be listed as Native American. Given the low percentage of missing race data and the limited number of Hawaiians in our area, we do not consider misclassification of Native American infants to be a major threat to our findings.

In sum, the findings of this study suggest that typical at-risk antenatal profiles may not be consistently associated with adverse neonatal outcomes such as LBW or prematurity across all racial groups of infants. These findings have implications for public health officials in terms of designing prenatal care services sensitive to the needs of various racial groups of prenatal women. The findings also point to the need to delve further into the role of other sociodemographic behavioral or cultural factors that may intervene or impact on the birth outcomes of at-risk pregnant women.

References

1. Taffel, S.: Characteristics of American Indian and Alaska Native births: United States, 1984. National Center for Health Statistics. Monthly Vital Statistics Report, vol. 36,

No. 3, supp., DHHS Publication No. (PHS) 87-1120. U.S. Government Printing Office, Washington, DC, June 1987.

2. U.S. Bureau of the Census: 1980 census of population, supplementary report: American Indian areas and Alaska Native villages, 1980. Publication No. PC80-S1-13. U.S. Government Printing Office, Washington, DC, August 1984.

3. U.S. Bureau of the Census: 1980 census of population. Vol. 1, characteristics of the population. Ch. C, general social and economic characteristics, pt. 1, United States summary. Publication No. PC80-1-C1. U.S. Government Printing Office, Washington, DC, December 1983.

4. Indian Health Service: Trends in Indian health. Public Health Service, U.S. Government Printing Office, Washington, DC, 1990.

5. New York State Department of Health: Vital statistics of New York State, 1985. Albany, 1985, p. 171.

6. National Center for Health Statistics: Vital statistics of the United States, 1987. Vol. 1, Natality. DHHS Publication No. (PHS) 89-1100. Public Health Service, U.S. Government Printing Office, Washington, DC, 1989.

7. U.S. Bureau of the Census: General population characteristics, New York. Publication No. PC80-1-B34. U.S. Government Printing Office, Washington, DC, 1982.

8. Institute of Medicine: Preventing low birthweight—summary. National Academy Press, Washington, DC, 1985.

9. Massion, C., et al.: Screening for gestational diabetes in a high-risk population. *J Fam Pract* 25: 569-575 (1987).

10. West, K. M.: Diabetes in American Indians and other native populations of the new world. *Diabetes* 23: 841-855 (1974).

11. Kline, J., Stein, Z., and Susser, M.: Conception to birth: epidemiology of prenatal development. Oxford University Press, New York, 1989, pp. 276-281.

12. Kleinman, J.: Infant mortality among racial/ethnic minority groups, 1983-1984. *MMWR* 39 (SS-3): 31-39, July 1990.

13. Kramer, M. S., et al.: The validity of gestational age estimation by menstrual dating in term, preterm, and postterm gestations. *JAMA* 260: 3306-3308, Dec. 9, 1988.

14. Buekens, P., et al.: Epidemiology of pregnancies with unknown last menstrual period. *J Epidemiol Community Health* 38: 79-80 (1984).